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DIFFERENTIAL EFFECTS OF TOKEN REINFORCEMENT ON INSTRUCTION-FOLLOWING BEHAVIOR IN RETARDED STUDENTS INSTRUCTED AS A GROUP[1]

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This study was addressed to the problem of applying behavior modification techniques on a group basis to a class of retarded students with "attentional deficits". Seven boys, age 8 to 15 yr, characterized as showing severe "attentional" problems or disruptive behavior in their respective classrooms, participated daily for 30-min sessions in a special class over a 1.5-month period. In each session, verbal instructions were given to the class as a whole. In control sessions, each appropriate instruction-following response by a child produced praise for that child. In experimental sessions, appropriate responses also produced tokens exchangeable for tangible reinforcers after the session. Token reinforcement differentially maintained instruction-following behavior in four children while one responded appropriately to most instructions and a second improved continuously during the study. While the data suggest that the present approach can be successfully applied to the alteration of instruction-following behavior in retarded children, its major contribution may be that of providing objective quantitative information about such behavior.

Many behavior modification studies have been conducted in the classroom setting (*i.e.*, Hall, Lund, and Jackson, 1968; Harris, Wolf, and Baer, 1964; Zimmerman and Zimmerman, 1962). Most such studies have focussed upon the objective assessment of treatments applied to individual class members. In contrast, several classroom studies have involved (a) the concurrent, systematic treatment of each student participating in the class, and (b) the application of a set of common treatments to all members of the class (*i.e.*, Birnbrauer, Wolf, Kidder, and Tague, 1965; Burchard, 1965). These and similar studies have involved individually groomed classroom assignments, but have placed greater emphasis upon treating the class as a whole in that every member of the class is exposed to similar sets of differential token-reinforcement contingencies.

A related set of classroom procedures was applied recently by Bushell, Wrobel, and Michaelis (1968). Their procedures placed less emphasis upon the idiosyncratic treatment of individual class members and more emphasis upon the use of a set of common treatments. Classroom assignments were not explicitly groomed to specific individuals. Under conditions in which class members engaged in several different activities, all were exposed to one generally defined set of differential token-reinforcement contingencies.

To our knowledge, no published study has employed a procedure that exclusively involved the concurrent exposure of all class members to a single, specific set of differential-reinforcement contingencies. Although Burchard (1965, Exp. 1) applied such a set of contingencies to the sitting-at-desk behavior of each member of his class, this common treatment was employed in the context of the concurrent application of separate, individually groomed reinforcement contingencies.

The obvious need to develop techniques to facilitate the efficient instruction of an entire group of students under conditions in which behavior in each member can be monitored and examined as a function of common instructional procedures and common treatments, gave impetus to the present study. The general purpose of this study was that of experimentally examining a classroom procedure designed for use with a group of retarded students characterized by their teachers as having

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"severe attentional deficits" and/or frequently displaying behaviors disruptive to ongoing classroom activities. The specific purpose was to examine behavior in each class member under conditions in which the class was addressed as a whole and as a function of the application of two sets of common response-contingent consequences.

Before implementing and conducting the study the experimenters informally observed the tentatively selected subjects in their classroom settings and interacted with their teachers in informal conferences. The latter interactions suggested that the teachers tended to attribute disruptive behavior and other undesirable classroom performances to the students' "attentional deficits". The only generalization which could be made after informally observing the students' classroom performances was that each frequently failed to follow instructions. As a consequence, we designed a list of simple classroom instructions and used instruction-following behavior as the dependent variable. In line with the specific purposes of this investigation, instructions were presented to the group at large and as a whole and appropriate behavior was examined as a function of response-contingent praise and response-contingent token reinforcement.

METHOD

Subjects and Setting

Seven retarded boys with "attentional problems", selected by teacher recommendation from three classes at the Noble School in Indianapolis, served as the members of the experimental class. A brief clinical description of each is provided in Table 1.

The study was conducted in a 10- by 15-ft room that contained a teacher's desk and chair, a round table around which were placed seven student chairs, and the materials and props that were utilized in conjunction with the instruction list and token-reinforcement system. The seven students participated as a class in daily 30-min sessions over a period of seven weeks. A dimly lighted, empty classroom immediately adjacent to the experimental room was used for timeout purposes, and occasionally served as an observation room for interested faculty. This observation was facilitated by a one-way vision mirror mounted in the door between the two rooms.

Table 1

Age, I.Q., and Diagnosis of Each Subject

Subject	*Age (years)*	*I.Q.*	*Diagnosis*
S_1	8	46	Moderately retarded
S_2	11	40	Moderately retarded, brain-damaged
S_3	9	70	Mildly retarded, educable but deaf
S_4	10	41	Brain-damaged, autistic, hyperactive
S_5	11.5	48	Moderately retarded
S_6	9.5	25 or below	Severely retarded, atoxic spinal deformity
S_7	15	30	Cerebral dysgenesis

The Instruction List

Five initial sessions were devoted to observing the students in the experimental room and to constructing an instruction list that could be used to measure objectively the instruction-following behavior. The list was constructed on the basis of several considerations and criteria. First, items on the list were to call for many behaviors already within the repertoires of the subjects. Prior informal observations of the subjects in their classroom settings and interactions with their teachers permitted the listing of behaviors that were either observed to be or alleged to be in the subjects' repertoire. Second, and this was considered of paramount importance, items were to call for behaviors that could be easily and objectively monitored; observers would not be called upon to make judgments based on ambiguously defined behaviors. Finally, it was considered important to construct a list that would call for a broad spectrum of observable behaviors, since a functional repertoire generally accepted as being prerequisite for any student if he is to benefit from a classroom experience would include many different kinds of instruction-following responses. Classes of behavior called for by the instruction list included: motor performance, imitation, recognition, verbalization, and other social behavior.

An initial list was constructed and tested. This was revised several times in order to improve the continuity and logical sequencing of the items and to replace ambiguous items with items that called for more readily and reliably monitored behaviors. In addition,

to further emphasize the importance of "paying attention" on the part of the students, while at the same time maintaining the systematic and highly structured nature of the classroom procedures to be employed, the order of items on the final list was fixed, but equivalent choices of instructions were installed within more than half of the items. For example, item 21 always followed item 20 but the instruction: "Point to the picture of the *dog*", could be substituted for by "Point to the picture of the *rabbit (lion)*". In the subsequent formal application of the instruction list, choices within such items were varied randomly from session to session.

The final version of the 30-item instruction list is presented in Table 2. The first 25 items were group items presented to the class as a whole. The five final items were directed to specific individuals. Their inclusion permitted examination of behaviors that could not be reliably monitored in individuals under conditions in which two or more children responded concurrently.

Specific Experimental Procedures

The subjects, as a group, were exposed to a successive series of control and experimental conditions, designed to assess the effects of token reinforcement delivered contingent upon the behavior of following instructions. In each of 11 control and eight experimental (token-reinforcement) sessions, the following standard operating procedures were employed:

(1) Each of three adults followed a copy of the 30-item instruction list. One adult served as instructor and the other two acted as independent observers. The instructor read items from the instruction list one at a time, and praised any subject who responded appropriately. The praise was simply the statement: "Very good, (name of subject who responded correctly)". Concurrently, and independently, each observer recorded correct responses. The roles of instructor and observers were alternated across sessions.

(1a) The first 25 items were exclusively directed to the group at large. Each was repeated once before the next item was read in order to provide two opportunities for appropriate responding. The final five items were each first directed to the group at large and then individually to each eligible (see below) child. As in the case of the other items, in order to provide two opportunities for appropriate responding, each individually directed item was repeated once to the same individual before the next individual was instructed.

(1b) The pacing of the instructions and repetitions was based upon the behavior of the subjects, rather than upon an arbitrarily prearranged set of temporal criteria. A subject's behavior-based pacing procedure was chosen because we wished to employ an instructional procedure that could not only be systematically employed and objectively defined, but which would also be practical in the sense that it could be employed by a teacher working alone. While a time-based pacing procedure could probably be devised to meet all these criteria, the procedure employed (described immediately below) would probably be more readily negotiable by a teacher without props or outside aid.

In the case of each of the 25 group items, the instructor presented an instruction, monitored the group, and praised any child immediately after he correctly followed an instruction, provided that the child was eligible for such praise. Eligibility was determined on the basis of a set of rules which involved among other things the differential pacing of given instructions. More specifically, in the case of 23 of the 25 items, praise was given to each child who responded to the instruction immediately after it was presented. If a child who did not immediately respond correctly did so while or immediately after another child was being praised, he too was praised. No child was praised twice for responding to the same item. As soon as the instructor failed to observe a single eligible child responding correctly, he immediately repeated the instruction. Praise was given to any remaining eligible child who immediately followed the repeated instruction. As soon as the instructor failed to observe any eligible child responding correctly, he proceeded to read the next instruction.

In contrast with most of the instructions, in the case of two of the alternative choices of item 11, and in the case of item 14, the instruction could not readily and/or immediately be negotiated by a subject with a single movement or set of movements. Thus, after items 11 or 14 were presented, the instructor paused as long as at least one child was in the process of correctly following the instruction. As soon

Table 2

The Final Instruction List

Items are listed in the order that they were presented on the instruction list sheets. Underlined words were read to the class at large. Words not underlined served merely as information to the teacher. Alternatives within items appear in parentheses.

1. Sit down at the table and raise your hand. Reinforce and check only if seated for all "sitting" items.
2. Sit down at the table and do what I do. (clap hands tap head salute)
3. Get on the line. (point at the line on floor.)
4. Sit down at the table and point at your (nose mouth eyes ears).
5. Stand behind desk. Come to me.
6. Take out some clean sheets of paper from desk and place on desk. Take one piece of paper. Paper is now always available.
7. Take out crayons. Take one crayon. Spare crayons now always available.
8. Sit down at the table and draw what I draw. Draw (A B C D E).
9. Sit down at the table and draw what I draw. Draw a (diamond square triangle).
10. Sit down at the table and give your paper to another child.
11. Sit down at the table and draw a (circle face round clock).
12. Stand behind desk. Come up and show your paper to me.
13. Take out and hold scissors. Take one scissors. Put them on desk.
14. Sit down at the table and cut out the (circle face round clock) that you drew. Must approximate circle.
15. Stand behind desk. Bring me what you cut out. Acceptable to bring anything he just cut out providing it approximates circle.
16. There is a picture of a triangle on the wall. Point to the picture of the triangle.
17. Stand against one of the walls. Back to wall.
18. There are pieces of colored paper on the walls. Point to the (green blue pink) paper.
19. Sit down at the table and do what I do. (Tap table with one hand. Tap table with two hands. Place both hands in the middle of the table.)
20. Sit down at the table and touch another child's (hand chest arm).
21. There are animal pictures on the walls. Point to the picture of the (dog lion rabbit).
22. Sit down at the table and hold up (1 2 3 4 5) fingers.
23. There are pictures of numbers on the walls. Point to the number (1 2 3 4).
24. Sit down at the table and do what I do. Hold up (1 2 3 4 5) fingers.
25. Stand behind desk. Pick up one scissors and bring it to me.

INDIVIDUAL ITEMS

26. Sit down at the table. Individually to each child who is seated Get up and point to your name.
27. Sit down at the table. Individually to each child who is seated Say what I say (Good morning teacher. How are you? I am fine).
28. Sit down at the table. Individually to each child who is seated Tell me your name.
29. Sit down at the table. Individually to each child who is seated Count to (2 3 4 5).
30. Sit down at the table. Individually to each child who is seated Say what I say (A, B, C, D 1, 2, 3, 4 Red, white and blue).

as a correct instruction-following sequence was completed by a given subject, the latter was praised. This procedure obtained until no eligible child was observed to be in the process of correctly following the instruction. At that time the item was repeated. The rule for going on to the next instruction was the same as the rule for repeating the item.

In the case of each of the five individually directed items, the instructor first presented the item to the group at large and then to a specific eligible individual. If the individual did not immediately respond correctly, the item was repeated to that same individual. If the individual did not immediately respond correctly to the repetition, the item was then presented to a different individual. If and when the item was correctly responded to by the individual to whom it was directed, the latter was immediately praised and the item was then immediately presented to the next individual. This procedure continued until all eligible children were given the opportunity to respond and then the next numbered item was presented with the entire process repeated.

(1c) For each of the first 25 items each observer independently monitored all members of the class, while for each of the final five items each observer focussed upon the specific individual to whom an instruction was directed. Each observer placed a check in the appropriate space on the instruction list when he observed a subject responding appropriately to a given instruction. A subject was checked for a correct response even if the instructor failed to praise the child. Similarly, a subject was not checked for a correct response if it was not observed, even if the instructor praised the child. Finally, a child could be checked for a maximum of only one correct response per item, even if he responded correctly to it on each repetition.

(2) Behaviors incompatible with following instructions (for example, running around the room or shouting) were generally ignored. Exceptions to ignoring inappropriate behavior took place when one subject aggressed physically against another, or if a subject tampered with exchange items present in a compartmentalized box during token-training and token-reinforcement sessions. When the latter behaviors occurred, they produced a timeout for the offending subject. He was placed alone in a dimly lighted adjacent room by the instructor for a period of 10 to 20 sec (the instructor counted silently to 15). No timeout termination delay contingency was applied because offenders neither kicked nor screamed when placed in the timeout room.

All other procedures employed were idiosyncratic to particular control and experimental conditions and will be specified under the description of those specific conditions.

Table 3 lists the order of presentation of the control and experimental conditions, together with the associated consequences of attending to instructions. The associated number of successive daily sessions is also given.

Table 3

Order and nature of the conditions to which the group was exposed.

Condition	*Consequence of Following an Instruction*	*Number of Sessions Exposed*
Pre-Control (Pre-C_1)	Verbal praise only. Instructor says, "Very good, *(name)*"	2
Initial Control (C_1)	Same as Pre-C_1	3
Token Training	See text	4
Second Control (C_2)	Same as Pre-C_1	3
Initial Token (T_1)	Verbal praise as above plus token dropped into tumbler. Tokens exchanged for tangible reward at end of session.	3
Second Token (T_2)	Same as T_1 except that the words, "that's a token" are added to the verbal praise	2
Final Control (C_3)	Same as Pre-C_1	3
Final Token (T_3)	Same as T_2	3

Pre-control (Pre-C_1) condition. This was the first condition in which the standard operating procedures described above were employed. Subjects were exposed to each of two sessions in which a 30-item instruction list was used. A subject was praised by the instructor for each appropriate response, regardless of his physical place in the room.

Initial control (C_1) condition. In this condition, subjects were exposed to three sessions conducted exactly like the Pre-C_1 sessions with one exception. At this point and thereafter,

the final version of the instruction list was used. In this list the words "Sit down at the table and . . ." were added to 17 of the items. Now praise was contingent upon both being seated at the table and responding appropriately to the given instruction.

Token training. During the subsequent four sessions, standard operating procedures were not employed. In these sessions, the subjects were given a step-wise exposure to materials and procedures which would later form the basis of the token reinforcement system. During the first session, poker chips (referred to as tokens) were dispensed to each subject on a response-independent basis. That is, each token was delivered to a subject regardless of what he was doing. Each time a token was handed to a subject, it was immediately accompanied by an edible, such as candy. The token was taken back upon receipt of the edible. During the first few such exchanges, subjects were assisted manually. Later, subjects had independently to return the token to receive the edible. These initial steps were scheduled simply first to pair tokens with tangible reinforcers, and second to teach them to trade tokens for a reinforcer. During the initial part of the second session, similar exchanges were made but each exchange involved a choice of three edibles. As this session progressed, the subjects were exposed to a series of exchanges in which gradually increasing delays between token delivery and token exchange were systematically scheduled.

Before the third session, additional materials were introduced into the room. These included a wooden block which contained seven colored transparent tumblers and a 16-compartment box (called "the store") which was filled with tangible rewards. The tumbler block was placed on the teacher's desk. Each subject was assigned a particular tumbler which could be distinguished from every other tumbler on the basis of several independent stimulus dimensions such as color, position in the wooden block, and a geometric symbol painted directly under it on the block. To aid a fourth adult, who was to drop tokens into appropriate tumblers at appropriate times, each child's name appeared on the back of the block, beneath the appropriate tumbler. The "store" was placed on a chair in a corner of the room so that it was away from all other props. Articles "for sale" included small edibles, balloons, candy bars, whistles, toy cars, trucks and planes, and a variety of trinkets and other toys. They were arranged according to size and "price". The largest ("costliest") articles were placed in the two upper rows of four compartments each, while the smallest ("least expensive") articles were placed in the bottom row.

In the third and fourth token training sessions, the class was visually and functionally exposed to the tumblers and the store. Tokens were delivered into tumblers instead of directly to the children. In the first 10 min of the third session, tokens were delivered on a response-independent basis and subjects were called up one at a time to the teacher's desk after each delivery for the purpose of immediate exchange. Each removed his token from his tumbler, handed it to the teacher, and proceeded immediately to the store. Selection of a reward was permitted from the bottom row only at this point. Before one of these exchanges, and in an effort further to facilitate discrimination between the tumblers, each subject was asked to select and paste an animal sticker on his tumbler. During the remainder of this third session, tokens were delivered on a response-contingent basis. Instructions different from those on the instruction list were given to the group at large and praise, together with token reinforcement, was given to each individual who responded appropriately. After several sets of immediate exchange transpired, exchange delays were increased by going through three and then more instructions before calling any subjects up to the desk. The final delay involved a period of no exchange for 7 to 10 min.

The last token-training session was conducted in a manner similar to that which would be employed during subsequent experimental sessions; *i.e.*, throughout the session, appropriate responses produced praise and token reinforcement. As in the previous session, instructions were different from those on the instruction list, but, in contrast, only a single token exchange was scheduled at the end of the session. Each given subject had to be seated at the table in order to be eligible for his exchange. A subject who had earned nine or fewer tokens could choose an item only from the bottom row of the store. A subject who had earned from 10 to 19 tokens could choose an item from the two bottom rows.

Only 20 or more tokens allowed a child *carte blanche* at the store.

Second control (C_2) condition. To assess the effects of the token-training procedures, *per se*, on performance previously generated, the behavior of the subjects was again examined under control conditions. Data obtained after token training might reflect changes in behavior attributable to rapport and to the pleasant interactions implicit in the token-training procedure. Therefore, in an effort to avoid ambiguity of interpretation, the group was exposed to three additional control sessions immediately after token training terminated and before being exposed to the experimental conditions.

Initial token (T_1) and second token (T_2) conditions. The subjects were subsequently exposed to three sessions in which the behavioral effects of adding token reinforcement were examined. These sessions were conducted with the tumbler for tokens and the "store" present in the room. A fourth adult was available to drop tokens into appropriate tumblers when a subject was praised by the instructor. Tokens were exchanged for an article in the "store" at the end of the session.

During the initial two sessions under the T_1 condition, subjects were required to earn 20 tokens to gain free choice at the "store". Range of selection was restricted on the basis of the number of tokens less than 20 that were earned. In the third T_1 session, and in all subsequent token-reinforcement sessions, choices and restrictions placed upon choices were determined on an individual basis. A subject was given free choice of anything in the "store" if he earned more tokens than in the previous session. Subjects whose earnings equalled those of the previous session, were restricted to articles that appeared in the bottom two rows; those accumulating fewer tokens than in the previous session could select only from the bottom row.

Because of the possibility that some subjects may have failed to associate the verbal praise with the delivery of a token during the T_1 sessions, two additional token-reinforcement (T_2) sessions were conducted which differed from the T_1 sessions only in that the words, "that's a token" were added to the teacher's statement of praise.

Final control (C_3) and final token (T_3) conditions. To determine whether the differential effects of token reinforcement previously obtained could be reliably reproduced, the group was re-exposed to three additional control sessions and then to three additional token sessions. The C_3 sessions were conducted in the same fashion as the C_2 sessions and the T_3 sessions duplicated the T_2 sessions.

In each C and T session, two observers equipped with the instruction list placed a check mark in the appropriate space on that list whenever a given subject responded correctly. At the end of each session, the number of items responded to by each subject was independently totalled by each of the observers. When there was disagreement between the two totals for a given subject, the average of the two was taken as the subject's score for that session.

RESULTS AND DISCUSSION

Overview

For four of the seven subjects (Student 1 through Student 4), token reinforcement generated and maintained higher frequencies of instruction-following behavior compared to that behavior maintained under control (praise only) conditions. The behavior of Student 5 and Student 6 did not appear to be differentially influenced by the token-reinforcement procedure, but the data did provide important quantitative information about their instruction-following behavior over the course of the study. Finally, one subject (Student 7) failed to follow any instruction throughout the study.

Specific Results

Figures 1 through 6 present the daily results obtained from Student 1 through Student 6, respectively. In each figure, the total number of items responded to appropriately, per session, is plotted as a function of the successive control and experimental conditions.

Figure 1 presents the data obtained with Student 1. This subject responded appropriately to approximately 25 of the items during the first two sessions in which the standard operating procedures were employed. During these two pre-control condition (Pre-C_1) sessions, he was out of his seat and moving about the room much of the time. The instruction list used at this time did not require that he be seated in order to be praised by the instructor. As a con-

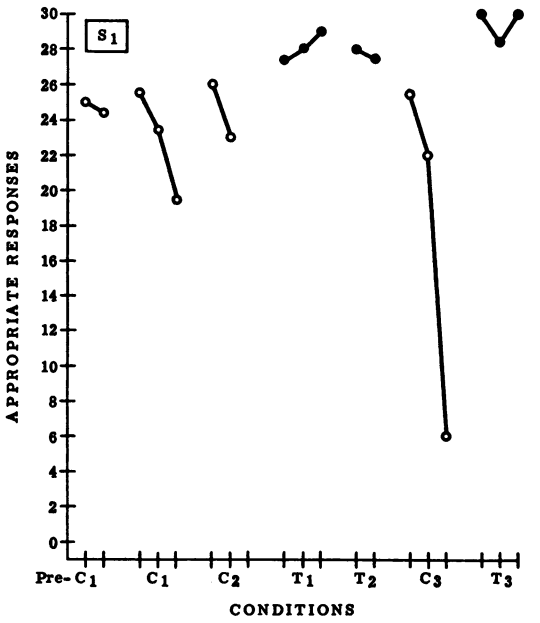

Fig. 1. Number of instructions followed by Student 1. In every session each such response produced praise ("Very nice, *name of student*"). In Pre-control (Pre-C_1) sessions praise was never contingent upon being seated at the table. In Initial Control (C_1) sessions and *all* sessions thereafter, praise was also contingent upon being seated at the table in the case of 17 instructions. In Initial Token (T_1) sessions appropriate responses also produced a token. In the remaining Token (T_2 and T_3) sessions, the words, "that's a token" were added to the praise.

sequence of the observation of this subject's concurrent appropriate and disorderly behaviors (as well as similar observations with other subjects), the final revision of the instruction list was made. This revision was designed to maximize the incompatibility of obtaining reinforcement while at the same time engaging in disorderly conduct. In the first control (C_1) session, the number of correct responses for Student 1 did not change, but it was apparent that he spent more time sitting at the table. In each of the two subsequent C_1 sessions, his total number of appropriate responses decreased. During the token-training sessions he was orderly and seemed attentive. During the C_2 session that immediately followed token training, his appropriate response total was identical to that obtained in the first C_1 session. In his next C_2 session this total decreased. This subject was not present for the final C_2 session.

In each of the first five (T_1 and T_2) token-reinforcement sessions, Student 1 responded correctly to between 27 and 29 items on the 30-item instruction list. Thus, each daily T_1 and T_2 total exceeded any obtained previously. In the first C_3 session, his response total decreased to 25. In the two subsequent C_3 sessions, his totals decreased markedly, and his disruptive behavior appeared to increase and subjectively resembled his behavior in his regular classroom. The total of only six correct responses which he obtained in the third C_3 session clearly indicates the extent to which his instruction-following behavior deteriorated. Finally, with the reinstatement of the token-reinforcement procedures in the T_3 sessions, appropriate responding on the part of S_1 increased markedly. He actually followed each of 30 instructions in two of the three T_3 sessions. The beneficial effect of token reinforcement was, thus, clearly established for this subject.

The results obtained with Student 1 were representative of results obtained with Students 2, 3, and 4. These results are shown in Fig. 2, 3, and 4, respectively. In the case of each of these subjects, the highest totals of correct responding were obtained in token-reinforcement sessions. Each of these three subjects differed from Student 1 in one respect. Their response totals increased, when the words, "that's a token", were added to the verbal reinforcement in the T_2 sessions. This

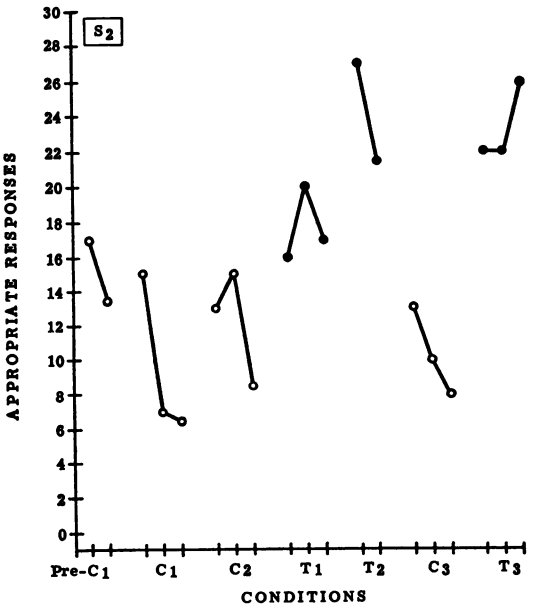

Fig. 2. Number of instructions followed by Student 2.

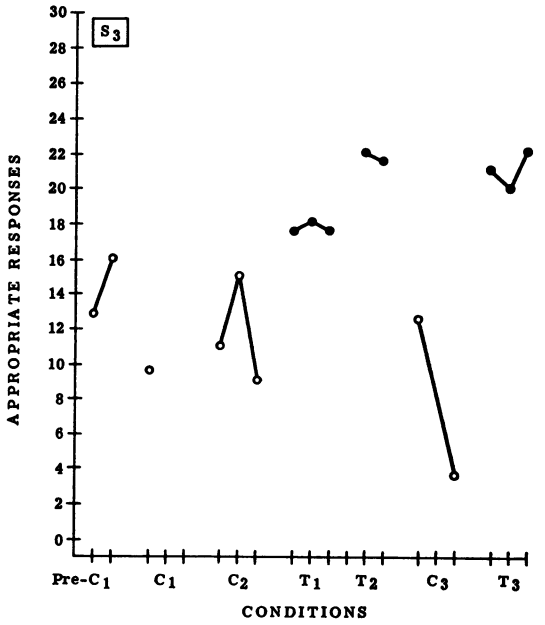

Fig. 3. Number of instructions followed by Student 3.

suggests that the use of this specific verbal bridge may have added to the effectiveness of the token-reinforcement system. This possibility must remain speculative, however, because this verbal factor was not systematically manipulated and because it is also quite possible that either (a) the changes in the token-exchange criteria introduced at the end of the third T_1 session and/or (b) continued exposure to token reinforcement, *per se*, could have accounted for the increases in appropriate response totals observed with these subjects after the third token-reinforcement session.

Two subjects did not appear to be differentially influenced by the application of token reinforcement over the study. Figure 5 presents the daily results for Student 5. Between the initial Pre-C_1 session and the final C_3 session, his totals of correct responding varied between 16 and 23. This range of values was obtained under both token-reinforcement and control conditions. That Student 5 may have been influenced by tokens is suggested only by the results obtained in the T_3 sessions. His highest totals in the study (26 and 25) were obtained in the first and third T_3 sessions. In general, however, it would be more appropriate to summarize his results by indicating that he responded appropriately to the majority of items throughout the investigation. We would point out that while Student 5's teacher reported that he "paid poor attention" in her class, the data obtained for him in the experimental class demonstrated that he was certainly capable of following simple instructions. In contrast, these data are not compatible with statements often made about this

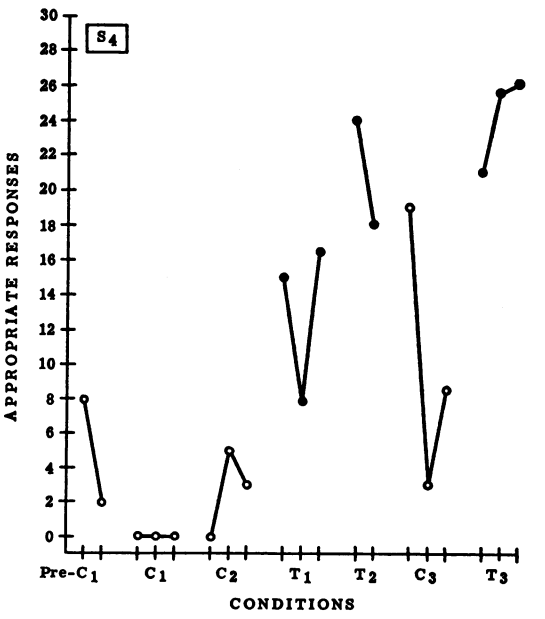

Fig. 4. Number of instructions followed by Student 4.

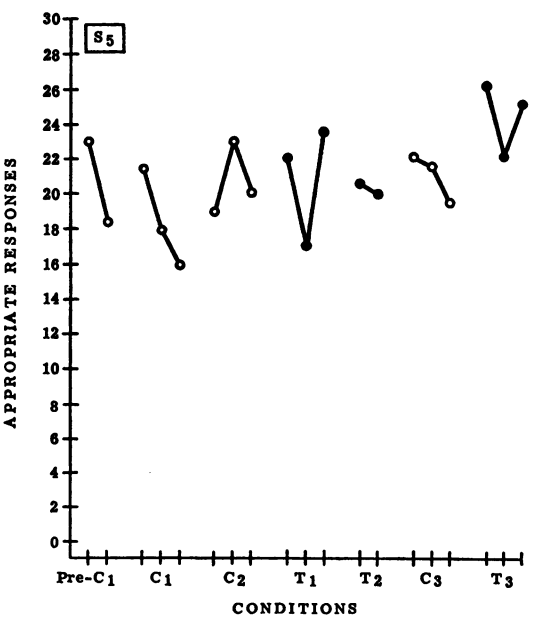

Fig. 5. Number of instructions followed by Student 5.

student which suggest that he has "severe attentional deficits". These data, when considered in combination with his reported classroom history and with the subjective interpretations of his regular classroom performance suggest that a systematic approach, *per se*, which is necessary to obtain objective behavioral measurements, may be critically important to the future successful education of this subject.

Figure 6 presents the results for Student 6. An examination of his results suggests that he continuously improved with respect to following instructions during the study and independent of specific conditions. This subject was assigned the lowest I.Q. of all subjects in this study. While on the one hand it might be argued that his results are certainly compatible with this evaluation (he followed fewer total instructions over the study than all but one subject) they are not compatible with several subjective reports which indicated that he was "incapable of paying attention and learning much of anything". The data obtained for Student 6 demonstrate that under repeated systematic exposure to at least one general set of classroom conditions, this child's instruction-following behavior can be accelerated. It is quite probable that this acceleration, observed over the course of the study, would not have been detected had we either subjectively observed his performance or exposed him to fewer sessions. Thus, as in the case of Student 5, the data obtained with Student 6 suggest that a systematic approach, *per se*, may also be critically important to his future education.

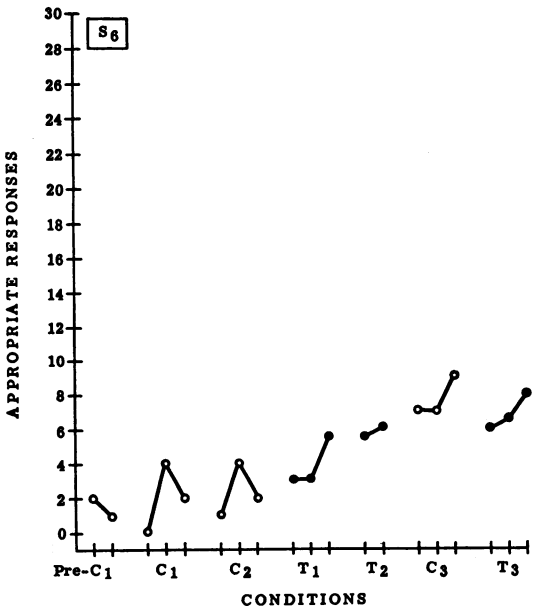

Fig. 6. Number of instructions followed by Student 6.

Student 7 failed to respond to any item on the instruction list throughout the study. He was, thus, a poor selection for the present approach. Informal efforts with this subject, in isolation, did indicate, however, that he might benefit from a reinforcement program applied on an individual basis.

Reliability of the Instruction List

In an experimental study such as the present one, the reliability of the data-gathering instrument depends upon the extent to which responses called for can be objectively monitored. On the basis of a comparison of the pairs of individual session totals obtained for each subject between the two independent observers across the study, the final list appeared to call for behaviors that were well defined and readily observable. In 55% of the daily individual subject totals compared, no disagreement was found between observers. Furthermore, a difference of only one response was obtained in the two totals in 33% of these comparisons. Finally, no difference greater than three responses was ever obtained in any comparison and this occurred in no more than 5% of the comparisons.

Associated Results and Further Discussion

Three additional sets of observations remain to be described. They involve (a) some comments about the effectiveness of the timeout procedure, (b) some speculations about a possible relationship between the potency of the present token-reinforcement procedures and the nature of the subjects' "attentional" problems, and (c) some impressions and speculations about the apparent development and differential maintenance of some social emergents.

Timeout. Timeout was primarily instituted to deal with occasions on which one subject aggressed physically against another. It was also used to discourage tampering with the store. Basically, this procedure involved the teacher's removal of an offending child from the experimental room. The offender was placed in the dimly lighted adjacent classroom. He was re-

turned to the classroom after the teacher had completed a silent count of 15. Had an offender emitted tantrum-like behavior while in isolation, termination of such behavior would have been required before permitting him to return; no such delay contingency was necessary. The use of timeout appeared to discourage repeated offending within any given session. It never had to be used more than twice in a given session and was used twice in only two sessions. Generally, when a subject was placed in timeout, no further timeout-producing behavior on the part of any of the subjects was observed over the remainder of that session. No definitive conclusions can be drawn with respect to the effects of timeout over sessions. Timeout was used after Student 5 tampered with the store on two occasions. These were both delivered during the first token-reinforcement session. The fact that this procedure never required repetition for this subject, suggests (but does not prove) its effectiveness. Timeouts were employed 18 times following aggressive behavior over the course of the study. Student 4 produced 13 of these. The fact that he received 11 timeouts during the initial 12 sessions and only two over the final 11 sessions might suggest that this procedure was effective across sessions. It should be pointed out, however, that he tended differentially to produce timeouts during control sessions, and that these comprised the majority of the initial sessions, while only three of the final 11 sessions were control sessions.

Potency of treatment and "attentional" problems. In first proposing this study to the principal and faculty of Noble School, we emphasized an interest in working with children whose disruptive behavior in and out of the classroom often led to their being characterized, among other things, as being "hyperactive". Over the course of the investigation, it was the impression of all observers that behavior that might be "attributed" to "hyperactivity" occurred less frequently during token sessions than during control sessions. The data obtained with some subjects over the investigation are certainly in logical agreement with these subjective impressions. What appears to be most significant about this observation is the fact that those four subjects who were reported to be "extremely hyperactive" and/or extremely disruptive in their regular classrooms were the same four subjects who showed dramatic improvement in instruction-following behavior under the token-reinforcement situation. To the extent that our subjective impressions were valid, these findings support the notion that a major observable contributor to "attentional deficit" type inferences drawn by teachers about students may be the frequent failure of the latter to follow instructions.

The apparent emergence of "helping" behavior. Perhaps of greatest relevance to the potential benefits that might be derived from the present and similar approaches, above and beyond those of economy and objective information, is the description of what subjectively appeared to be the emergence of potentially significant and unexpected social behavior. During the Pre-C_1, C_1 and C_2 sessions, although the class was treated as a group with respect to instructions, there appeared to be little, if any, group cohesiveness. The only interaction between members of the group involved "playful" and "not so playful" fighting between pairs of subjects. There did not appear to be any instance of "cooperation" between subjects or "assistance of one by another". In contrast, after the initial token session and in all subsequent token sessions, we frequently observed behaviors on the part of each of five subjects (Student 1 through Student 5) which (subjectively) appeared to be socially directed toward another subject, and which we inferred to be designed to help the latter subject earn reinforcement. On one occasion, for example, Student 1 brought scissors to Student 6 when scissors were needed to fulfill the requirement of an item on the instruction list. Various subjects were seen to raise Student 7's hand for him when an instruction called for that behavior. Other dramatic examples of similar social behaviors included Student 2 leading Student 4 to the table, thereby making the latter eligible for reinforcement, and Student 4 pointing to the appropriate card with the name of a fellow subject on it, seeming to encourage imitation.

We can, at best, only speculate about these alleged cases of "helping" behavior, because no objective measurement procedures were utilized to monitor their occurrence, and because no explicit contingencies were scheduled with respect to their occurrence. Tokens were not delivered to a subject as a consequence of "assisting another subject". The emergence of

this behavior could have crucially depended upon one or more of the characteristics of the program. This behavior may have been controlled, in part, by the presence or absence of the props and cues associated with token reinforcement, since it was apparently not observed during control sessions. This behavior could have emerged as a consequence of addressing the group as a whole and/or of the fact that all children could equally obtain tangible goods (competition was not involved).

Since the instructor and observers focussed their attention upon appropriate instruction-following behavior throughout this investigation, the observations reported above, while provocative, must be regarded as generally anecdotal in nature. Time limits set upon the present study did not permit a more systematic examination of these phenomena and excluded the possibility of further appropriate experimental manipulations.

A final comment. We have no special investment in token reinforcement, *per se*, as a method of generating and improving classroom behavior. A token-reinforcement system involves a complex set of procedures which demands much attention and includes vast numbers of stimulus elements and environmental variables. From an experimental point of view, those invested in the effects of token reinforcement would have carefully to isolate the numerous variables involved in order to determine objectively the factors necessary and sufficient to the generation of observed reliable behavioral changes. Instead, our bias is in the direction of a systematic arrangement of an environment and the systematic application of any given treatment in such way as to facilitate objective and reliable measurements. Quantitative data alone reveal whether a specific treatment (be it the use of token reinforcement, electric shock, M and M's, threats, or instructions) is therapeutic, ineffective, or noxious with respect to a chosen target behavior. In the case of the "treatment" applied and treatment effects assessed in the present study, the data suggest that the approach taken can be successfully applied to the problem of altering behavior of individuals treated as a group in a group setting. We would here reiterate that not every member of the group was differentially influenced by token reinforcement under the conditions which obtained. However, in the case of two of the three subjects who were not differentially influenced, the use of the present procedures provided objective information about their behavior which could be as valuable with respect to their further education as that provided for the subjects whose performances were differentially influenced by token reinforcement!

REFERENCES

Birnbrauer, J. S., Wolf, M. M., Kidder, J. D., and Tague, C. E. Classroom behavior of retarded pupils with token reinforcement. *Journal of Experimental Child Psychology*, 1965, **2**, 219-235.

Burchard, J. D. "Systematic socialization: a programmed environment for the habilitation of antisocial retardates," *Psychological Record*, 1967, **17**, 461-476.

Bushell, D., Wrobel, P. A., and Michaelis, M. L. Applying "group" contingencies to the classroom study behavior of preschool children. *Journal of Applied Behavior Analysis*, 1968, **1**, 55-61.

Hall, R. V., Lund, D., and Jackson, D. Effects of teacher attention on study behavior. *Journal of Applied Behavior Analysis*, 1968, **1**, 1-12.

Harris, F. R., Wolf, M. M., and Baer, D. M. Effects of adult social reinforcement on child behavior. *Young Children*, 1964, **20**, 8-17.

Zimmerman, E. H. and Zimmerman, J. The alteration of behavior in a special classroom situation. *Journal of the Experimental Analysis of Behavior*, 1962, **5**, 59-60.

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